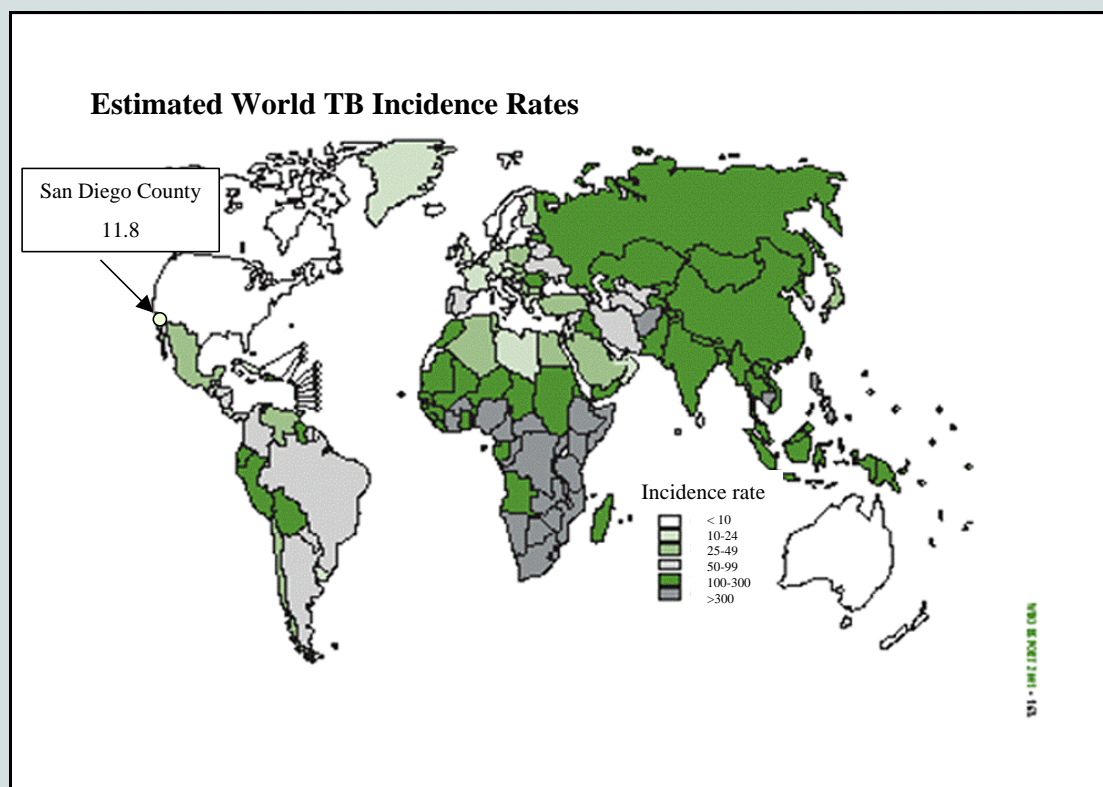




County of San Diego
Health and Human Services Agency
Office of Public Health

Tuberculosis Control Program 2001 Annual Report





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County of San Diego Tuberculosis Control Program 2001 Annual Report

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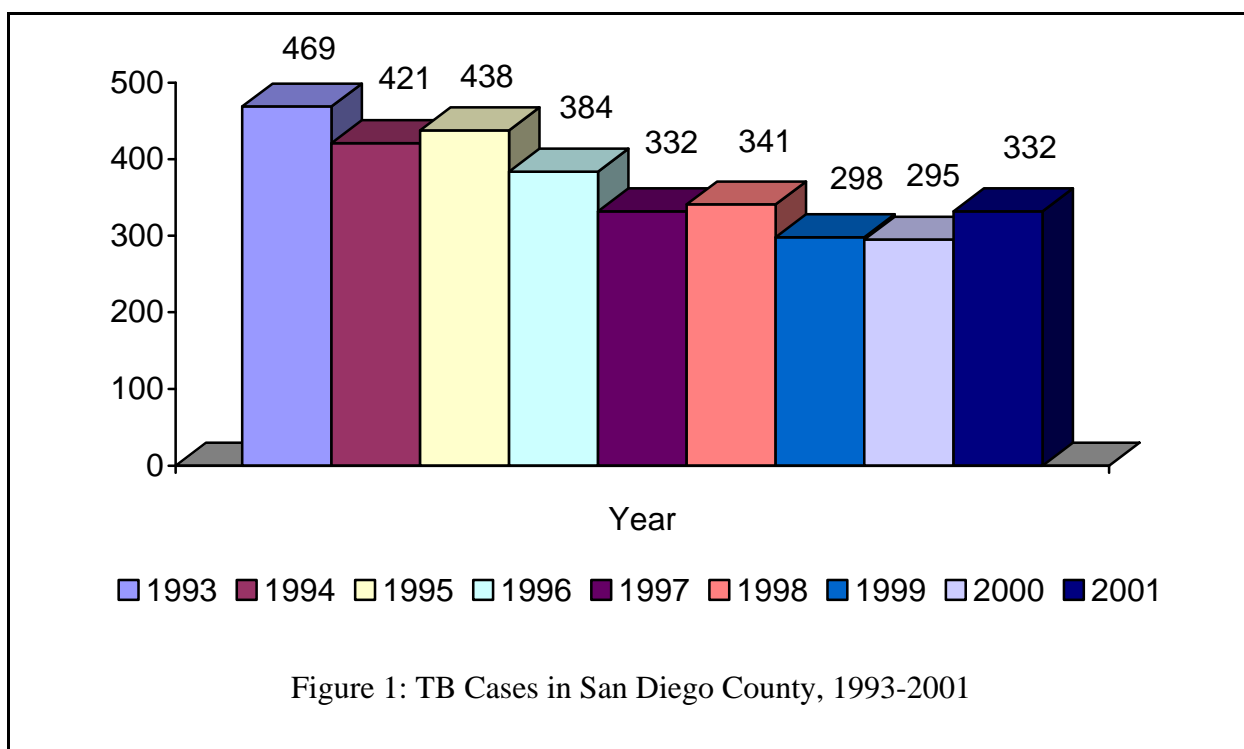
Introduction

Tuberculosis (TB), an infectious disease caused by the bacterium *Mycobacterium tuberculosis*, is one of the leading infectious causes of death in the world today (see cover for estimated case rates by country). It is estimated that one third of the world's population is infected with TB .

In the United States (US), TB was the leading cause of death in 1900. With the advent of effective treatment, the US experienced a steady decline in cases until the mid-1980s. A resurgence of TB occurred at that time, with national case rates peaking in the early 1990s. Through extensive public health interventions at the national, state, and local levels, TB is once again on the decline. Nationally, this trend continues with the year 2001 seeing the fewest reported cases in the US since 1953, the first year in which TB statistics were systematically recorded.

Case Counts and Rates

Between 1993 and 2000, trends in TB case rates in San Diego County generally paralleled those of the US, although the absolute rates were greater. In 2001, San Diego County reported 332 TB cases with a case rate* of 11.8 per 100,000 (Figures 1 and 2). This represents a 12.5% increase in cases from 2000 and a 16.8% increase in case rate from 2000. This follows a 37% case decrease from 2000 to 1993, the peak year of TB resurgence in San Diego County. In 2001, 15,991 TB cases (case rate of 5.6) were reported in the US and 3,332 cases (case rate of 9.7) were reported in California, representing a 2.3% decrease and 1.1% increase from 2000 case counts for the US and California, respectively.



* Unless otherwise specified, case rates are per 100,000.

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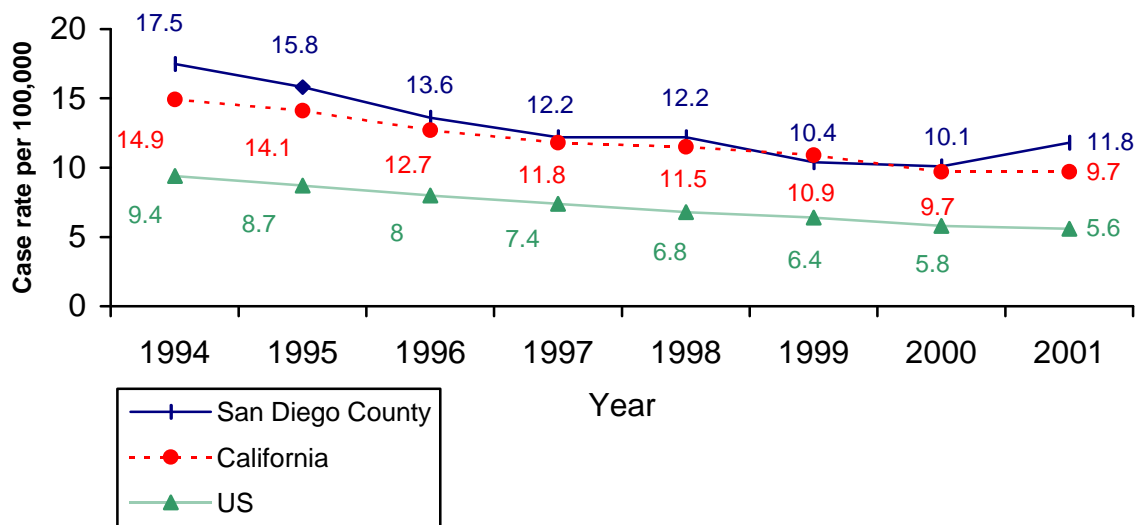


Figure 2: TB Case Rates in San Diego County, California, and the US, 1994-2001

Age

Children ages 0 to 4 accounted for 5% of cases in 2001 (Figure 3). There were 18 cases in this age group, a 54% decrease from 1993 (39 cases). US-born, Hispanic children comprised 61% of cases in the 0-4 age group in 2001. TB cases in young children are particularly important because they indicate recent transmission of disease. The median age of TB cases was 41, and ranged from 0 to 94 years of age. Persons aged 25 to 44 made up the largest group of TB cases, with 102 (31%). However, as a proportion of the population at risk, the 65 and older age group (61 cases) had the highest case rate (19.4).

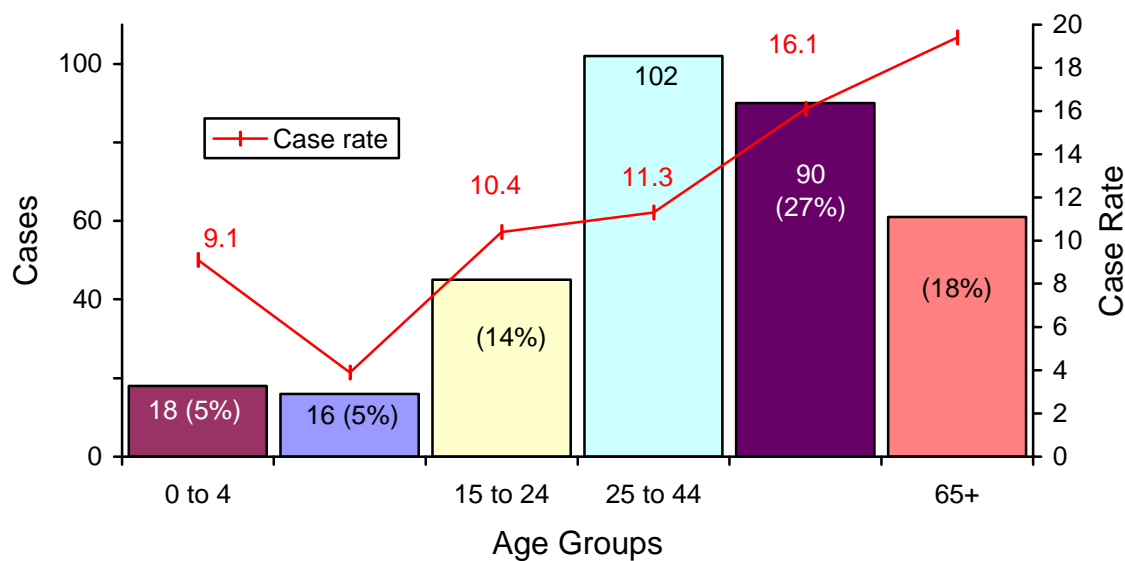


Figure 3: Case Distribution and Rates by Age in San Diego County, 2001

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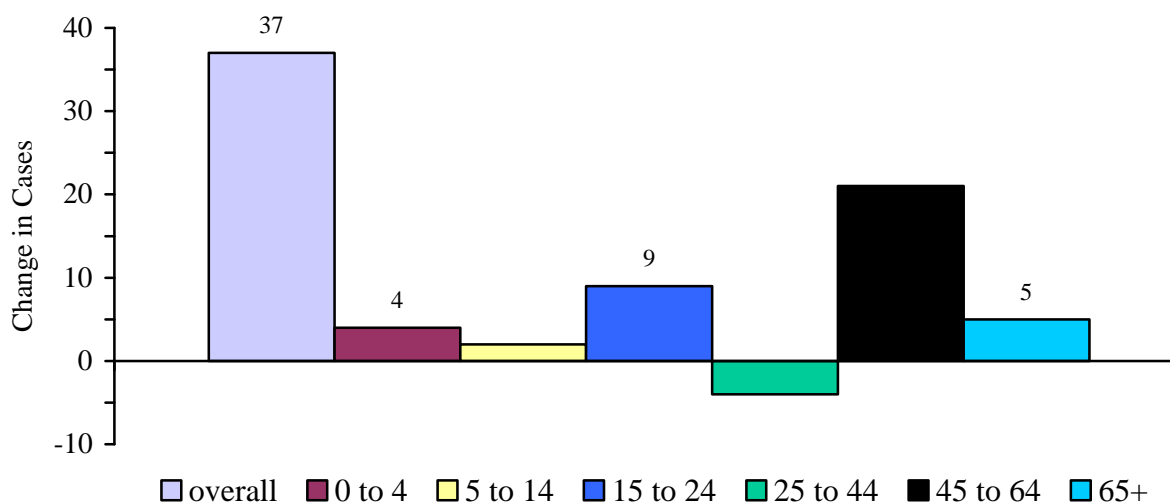


Figure 4: Change in TB Cases by Age Group, San Diego County 2000 to 2001

Between 2000 and 2001, TB cases in San Diego County increased in each age group except for the 25 to 44 age group (Figure 4). The largest increase was seen in the 45 to 64 age group (21, 30%). Significant percentage increases also occurred in the 0 to 4 (29%) and 15 to 24 (25%) age groups although the absolute case increases were modest in these age groups.

Race and Ethnicity

The distribution of TB cases in San Diego County by race/ethnicity in 2001 was 49% Hispanic, 30% Asian, 15% White, and 8% Black (Figure 5). The highest case rate (38.1) was found among Asians, followed by Hispanics (21.8), Blacks (12.9), and Whites (3.2).

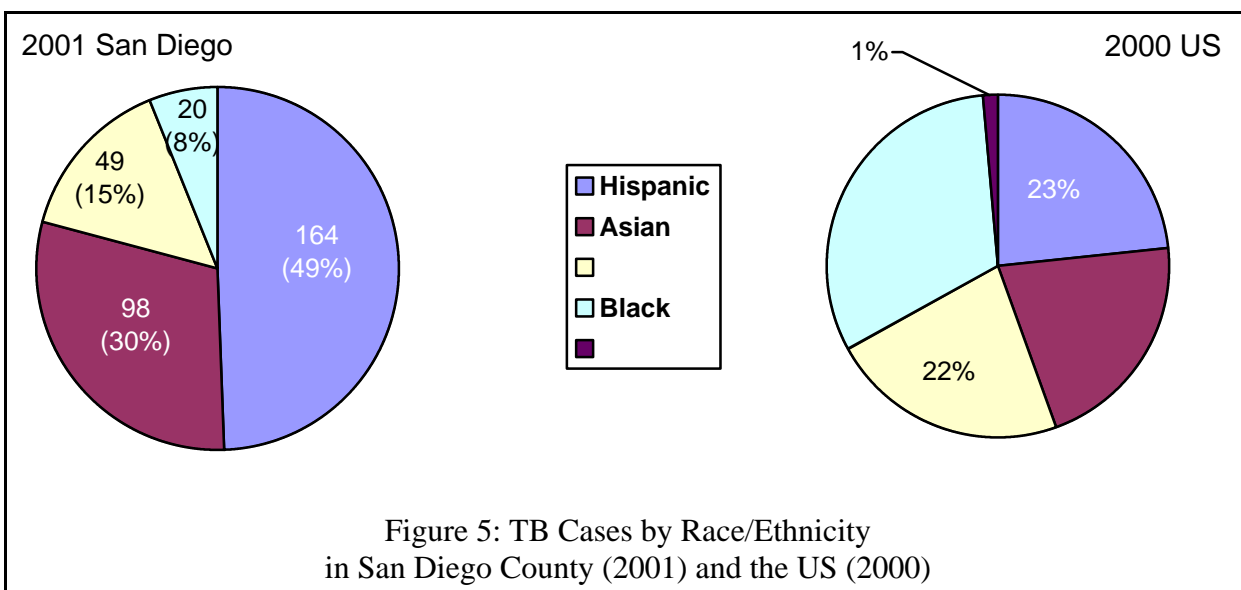
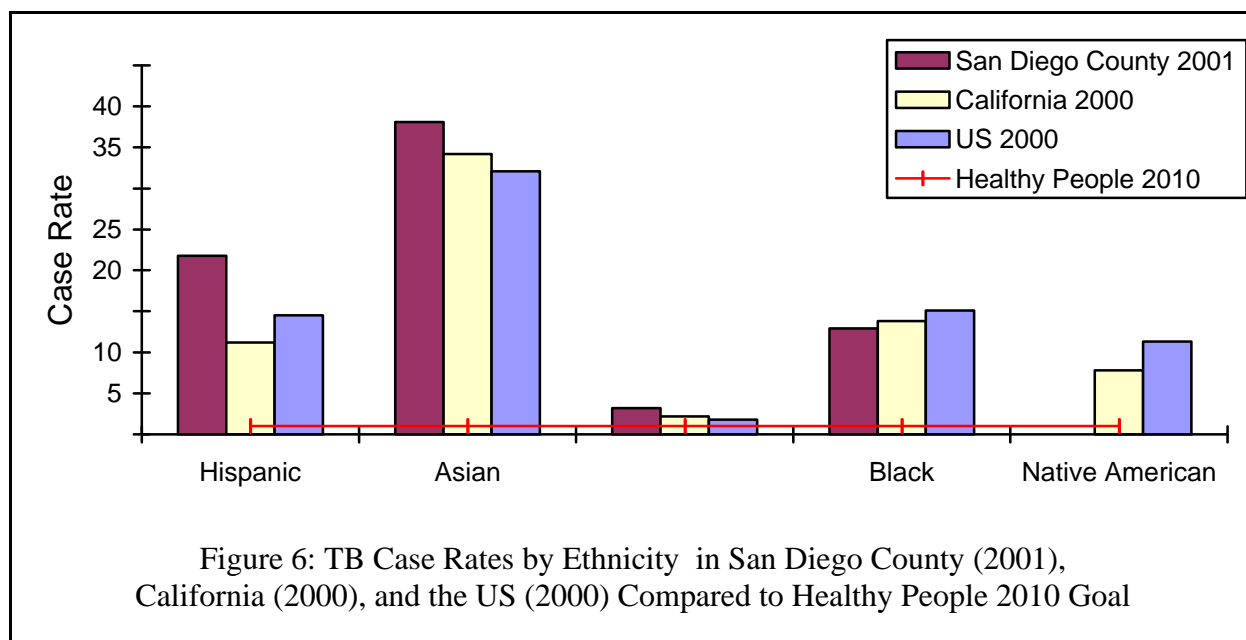


Figure 5: TB Cases by Race/Ethnicity in San Diego County (2001) and the US (2000)

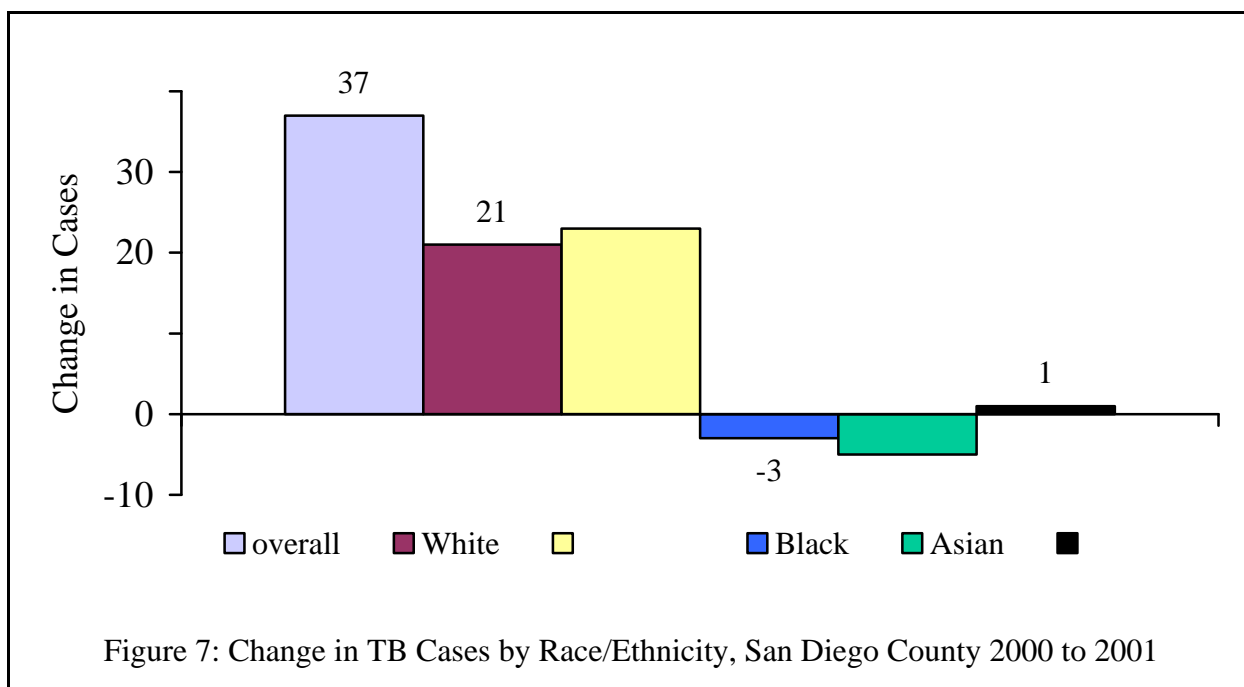
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For California (2000 data), the largest percentage of TB cases was found among Asians (41%), followed by Hispanics (36%), Whites (12%), Blacks (10%), and Native Americans (<1%). For the US (2000 data), the distribution of TB by race/ethnicity was 32% Black, 23% Hispanic, 22% White, 21% Asian, and 1% native American. (Complete demographic data for 2001 TB cases for California and the US are not yet available.)

Case rates by race/ethnicity are shown in Figure 6. For San Diego County (38.1), California (34.2), and the US (32.1), Asians had the highest case rate. Whites had the lowest case rate for California (2.2) and the US (1.8) and the second lowest case rate for San Diego County (3.2). For San Diego County, the lowest case rate occurred in Native Americans (< 1.0). The Healthy People 2010 goal for the overall US case rate is 1.0 (red line in Figure 6). As can be seen from the graph, only Whites are currently approaching this target.

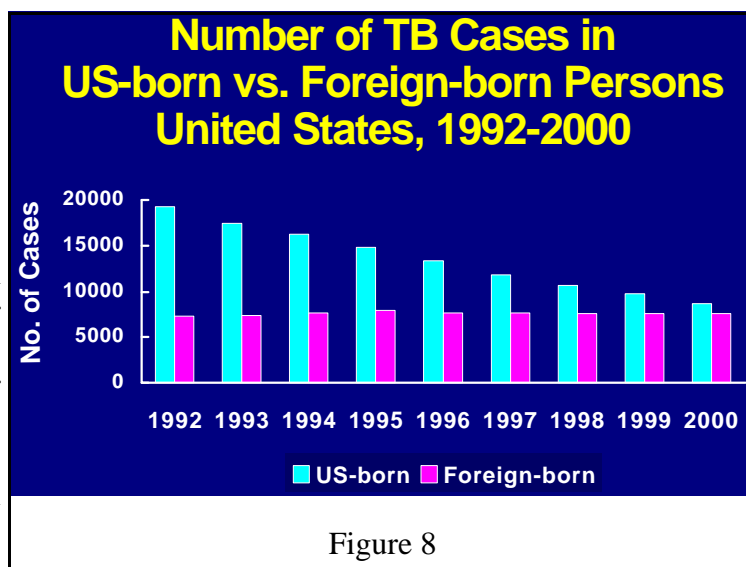
San Diego case rates among Hispanics are significantly higher than those seen in California or the US, likely reflecting the effect of San Diego's border location. Compared with California (2000 data), San Diego (2001 data) has a higher percentage of foreign-born Hispanic cases (35% versus 28%) and Mexican-born cases (35% versus 23%). Compared to year 2000 California foreign-born TB cases, a greater percentage of year 2001 San Diego TB foreign-born cases (37% versus 33%) resided in the US for 5 years or less.



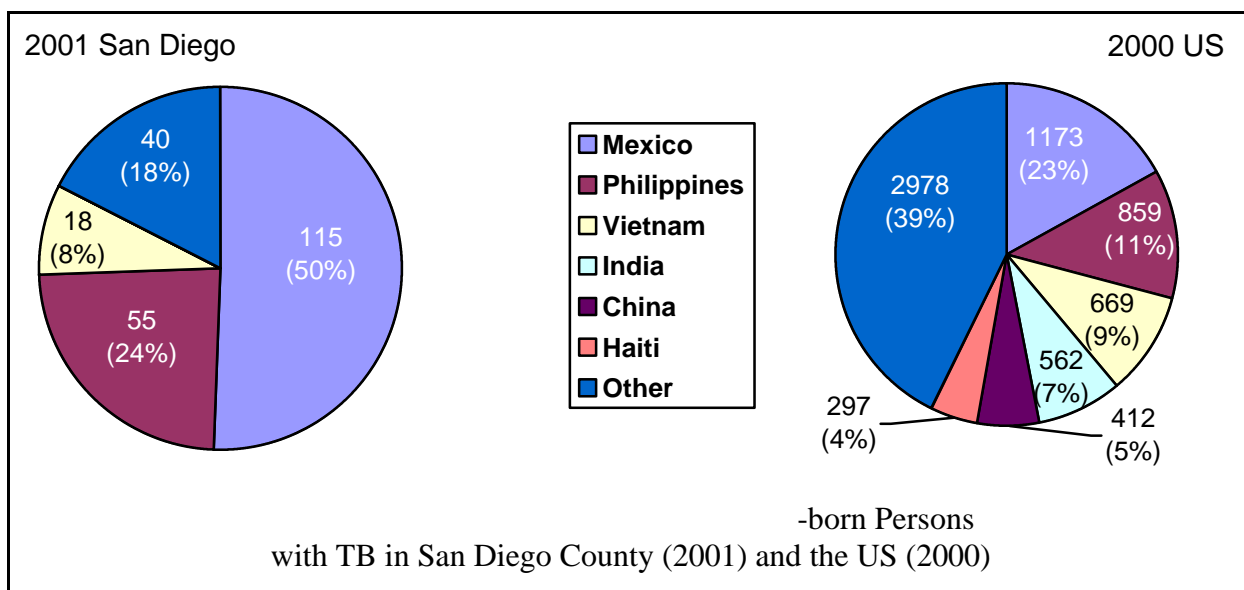
From 2000 to 2001, the largest case increase in TB cases in San Diego County occurred in Hispanics (23, 16%), but the largest percent increase occurred in Whites (21, 75%) (Figure 7). There were small decreases in cases among Blacks and Asians. A stratified analysis of changes in cases in Hispanics from 2000 to 2001 revealed the following: a 23 case increase in Hispanic males, a 14 case increase in HIV seropositive Hispanics, a 14 case increase in US-born Hispanics, a 9 case increase in foreign-born Hispanics (mostly from Mexico), and a 17 case increase in Hispanics using excess alcohol or illicit drugs. A stratified analysis of changes in cases in Whites from 2000 to 2001 revealed the following: a 7 case increase in Whites who were homeless, a 2 case increase in HIV seropositive Whites, a 14 case increase in US-born Whites, a 7 case increase in foreign-born Whites (mostly from eastern Europe), and a 7 case increase in Whites using excess alcohol or illicit drugs.

Country of Birth

A notable trend in TB epidemiology in the US has been the increase in the proportion of cases occurring in persons of foreign birth. Between 1992 and 2000, the percentage of TB cases in the foreign born increased from 27% to 46% (Figure 8). The number of cases in foreign-born persons remained at approximately 7,500 per year. During the same time period, cases among US-born individuals decreased from more than 19,000 in 1992 to fewer than 9,000 in 2000.



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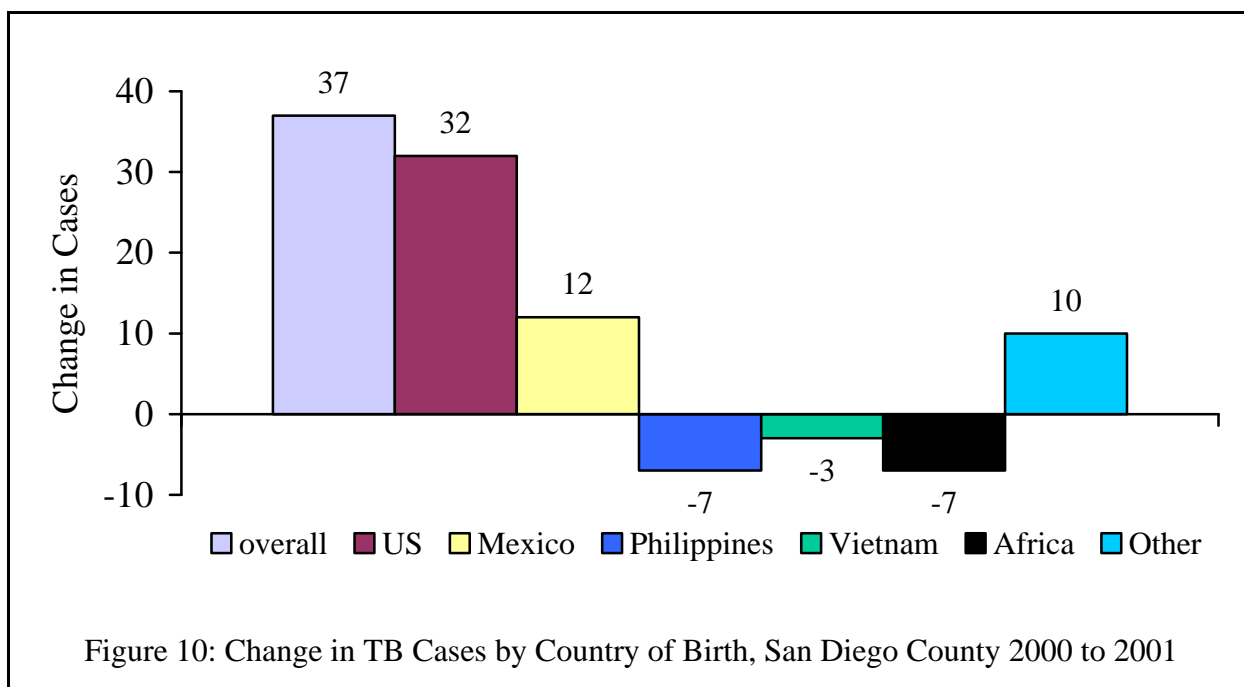
The most common countries of origin for persons of foreign birth with TB in the US in 2000 were Mexico (23%), the Philippines (11%), and Vietnam (9%) (Figure 9).

In San Diego County, foreign-born persons have consistently accounted for greater than 65% of TB cases (Table 1). In 2001, foreign-born persons comprised 69% of cases in San Diego County. The most common countries of origin for foreign-born TB cases in San Diego County in 2000 were Mexico (50%), the Philippines (24%), and Vietnam (8%) (Figure 9).

Recent studies of TB epidemiology in the foreign-born have shown that the majority of cases occur in immigrants who have been in the US for more than five years. The median time be-

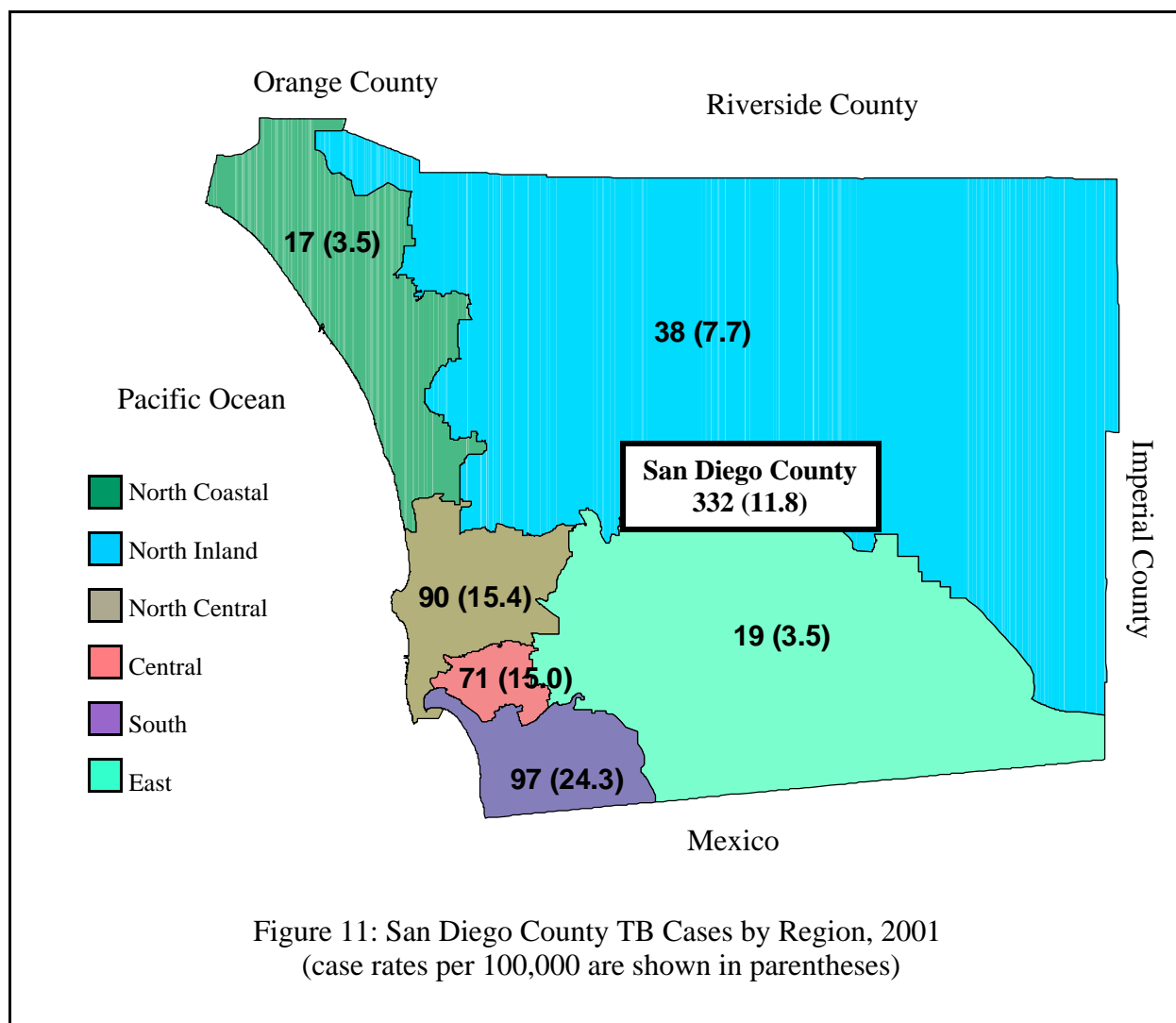
| Country of Origin | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 |
|-----------------------|------------|------------|------------|------------|------------|------------|
| THE AMERICAS | 235 | 192 | 224 | 190 | 179 | 222 |
| United States | 123 | 112 | 113 | 97 | 72 | 104 |
| Mexico | 105 | 76 | 106 | 87 | 103 | 115 |
| Other | 7 | 4 | 5 | 7 | 4 | 3 |
| ASIA | 127 | 126 | 105 | 94 | 96 | 96 |
| Vietnam | 26 | 17 | 14 | 18 | 21 | 18 |
| Philippines | 80 | 78 | 67 | 62 | 62 | 55 |
| Other | 21 | 31 | 24 | 14 | 13 | 23 |
| EUROPE | 4 | 3 | 4 | 4 | 2 | 6 |
| AFRICA | 16 | 7 | 6 | 8 | 14 | 7 |
| OTHER/UNKNOWN | 2 | 4 | 2 | 1 | 4 | 1 |
| TOTAL | 384 | 332 | 341 | 298 | 295 | 332 |
| % Foreign-born | 67 | 66 | 67 | 67 | 76 | 69 |

Table 1: TB Cases in San Diego County by Country of Origin, 1996-2001



tween arrival in the US and diagnosis of TB was 9.4 years for year 2001 foreign-born TB cases in San Diego County. In San Diego in 2001, 50 (22%) foreign-born TB cases were diagnosed within one year of entry into the US and 108 (47%) were diagnosed 10 or more years after arrival. Of the 50 foreign-born cases diagnosed in the first year, 11 (22%) were seen as part of a health screening required for all entering immigrants and refugees. Ten of these immigrants were classified as B1 waivers and one was classified as a B2 waiver. The overall case rate for San Diego County 2001 foreign-born TB cases was 42.4, compared with 4.7 for US-born cases.

From 2000 to 2001, TB cases in San Diego County in US-born persons increased by 32 (44%) and TB cases in foreign-born cases increased by 5 (2%) (Figure 10). Among foreign-born cases, the most significant increase was noted in persons born in Mexico (12, 12%). Cases among persons born in the Philippines, Vietnam and African countries decreased. For US-born TB cases, there was an increase of 11 in homeless persons and an increase of 5 in HIV seropositive persons. For Mexican-born TB cases, there was an increase of 11 among HIV seropositive persons.



Geographic Distribution

San Diego County encompasses approximately 4,000 square miles. The distribution of 2001 TB cases in San Diego County by health region is shown in Figure 11. The largest number of cases occurred in the South Region (97) which also had the highest case rate (24.3). Case rates by zip code are demonstrated in Figures 12 and 13. Zip codes with case rates above that of San Diego County as a whole, and especially zip codes with case rates above 15, were concentrated in the Central and South Regions.

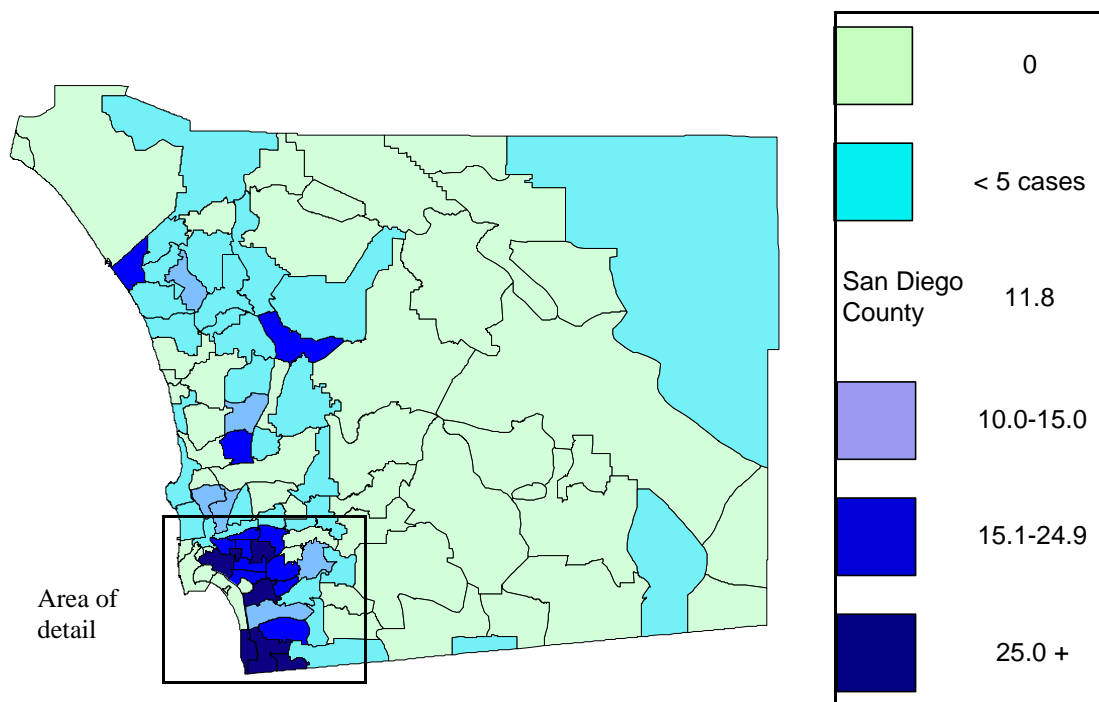


Figure 12: TB Case Rates by Zip Code for San Diego County, 2001

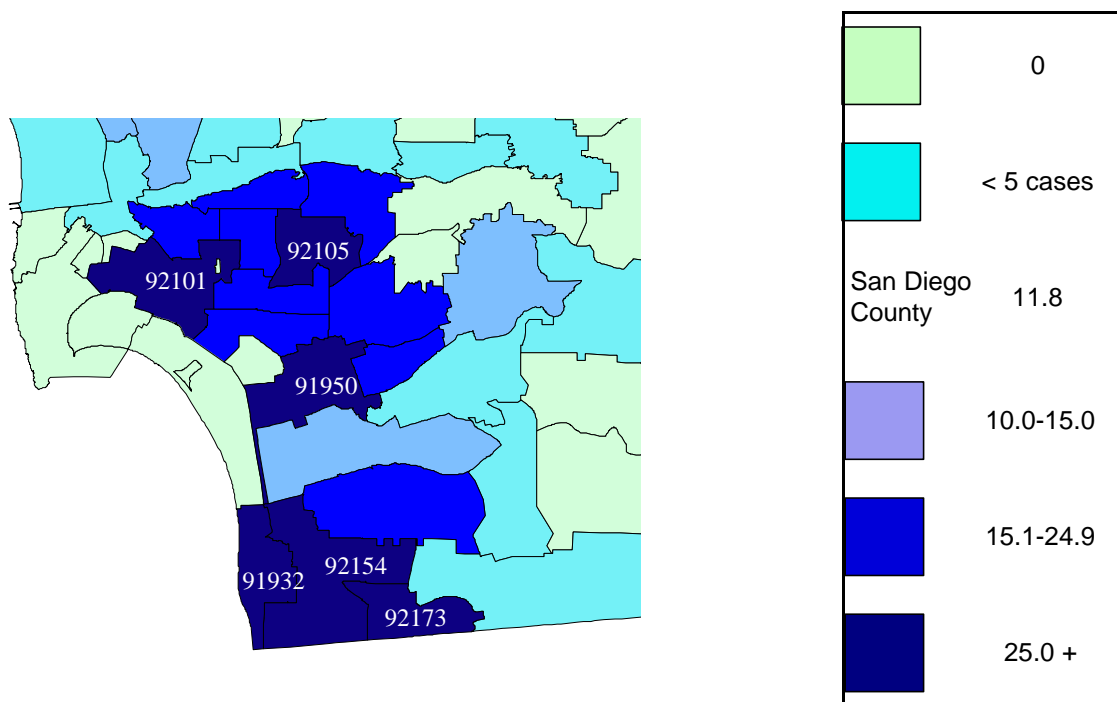


Figure 13: TB Case Rates by Zip Code, Zoom-in of Central and South Regions, 2001



| City | Cases | Rate | City | Cases | Rate |
|----------------|-------|------|-------------------|-------|------|
| Carlsbad | | * | National City | | 27.6 |
| Chula Vista | | 13.3 | Oceanside | | 8.7 |
| Coronado | | - | Poway | | * |
| Del Mar | | * | San Diego | | 16.5 |
| El Cajon | | * | San Marcos | | * |
| Encinitas | | - | San Ysidro | | 38.8 |
| Escondido | | 9.7 | Santee | | * |
| Imperial Beach | | 33.3 | Solana Beach | | - |
| La Mesa | | * | Vista | | 11.1 |
| Lemon Grove | | - | Other (10 cities) | | NA |

Table 2: San Diego County TB Cases and Case Rates (per 100,000) by City, 2001

Cases distributed by city are shown in Table 2. The city of San Diego had 202 cases (61% of total) with a case rate of 16.5. The cities with the highest case rates were San Ysidro (38.8), Imperial Beach (33.7), and National City (27.6).

From 2000 to 2001, the largest increase in TB cases in San Diego County occurred in the North Central Region (26, 40%) (Figure 14). The next largest increase was noted in the South Region (11, 13%). The North Inland and East Regions experienced small increases and the remaining

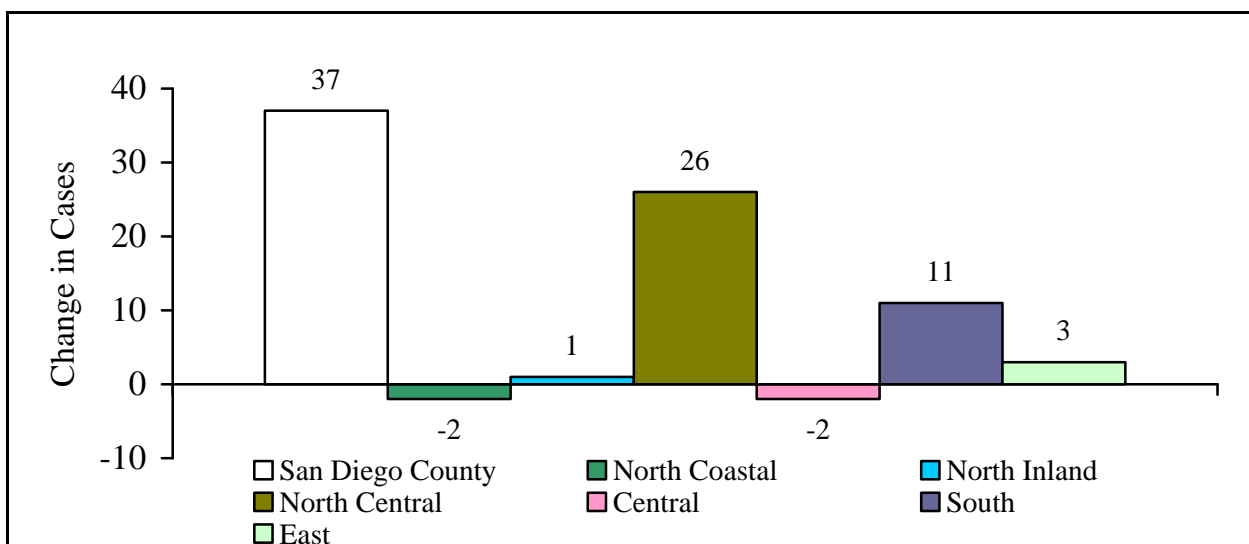


Figure 14: Change in TB Cases by Public Health Region, San Diego County 2000 to 2001

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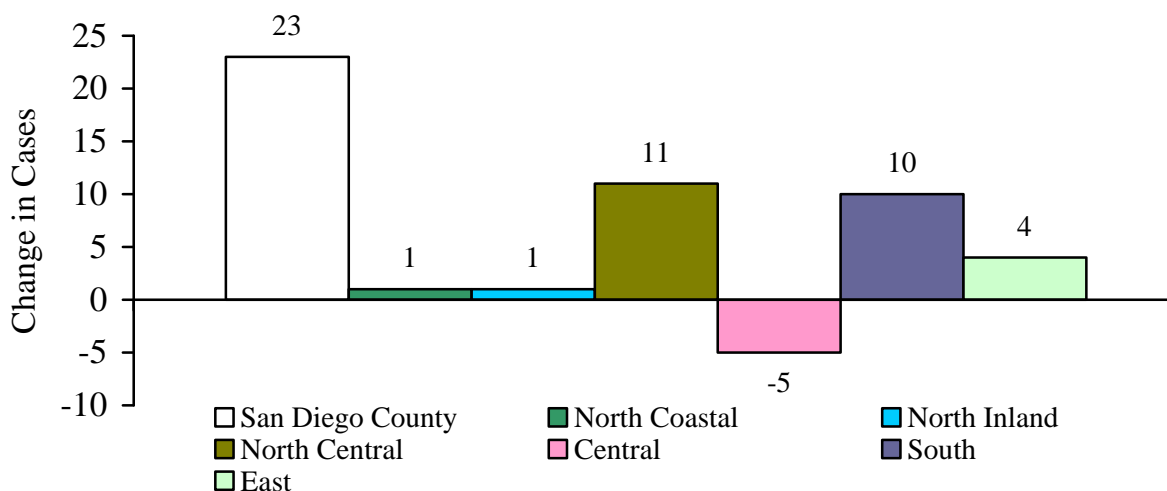


Figure 15: Change in Hispanic TB Cases by Public Health Region, San Diego County 2000 to 2001

regions had small decreases. For Hispanics, cases increased in every region except the Central Region, with the most pronounced increase occurring in the North Central and South Regions (Figure 15).

Body Site of Disease

The distribution of 2001 TB cases by primary site of disease is shown in Figure 16. The majority of cases were pulmonary (lung) (81%). The percentage of cases of pulmonary TB has remained fairly constant (73-81%) since 1994. Of patients with pulmonary disease as the primary site, 11% also had disease at an extrapulmonary site. Forty-eight percent of patients with pulmonary TB had at least one positive acid-fast bacillus (AFB) smear (indicative of a increased probability of infectiousness). TB of the lymph nodes was the second most common site of dis-

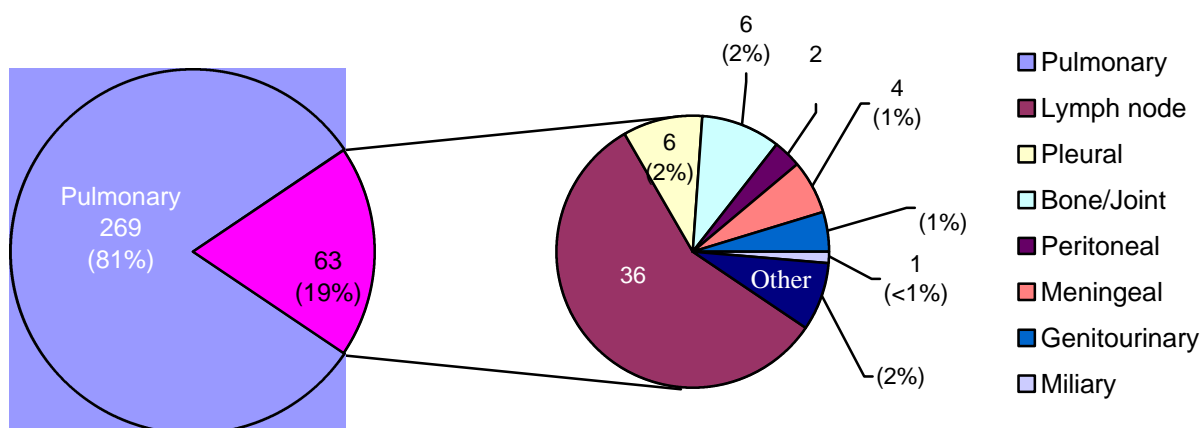
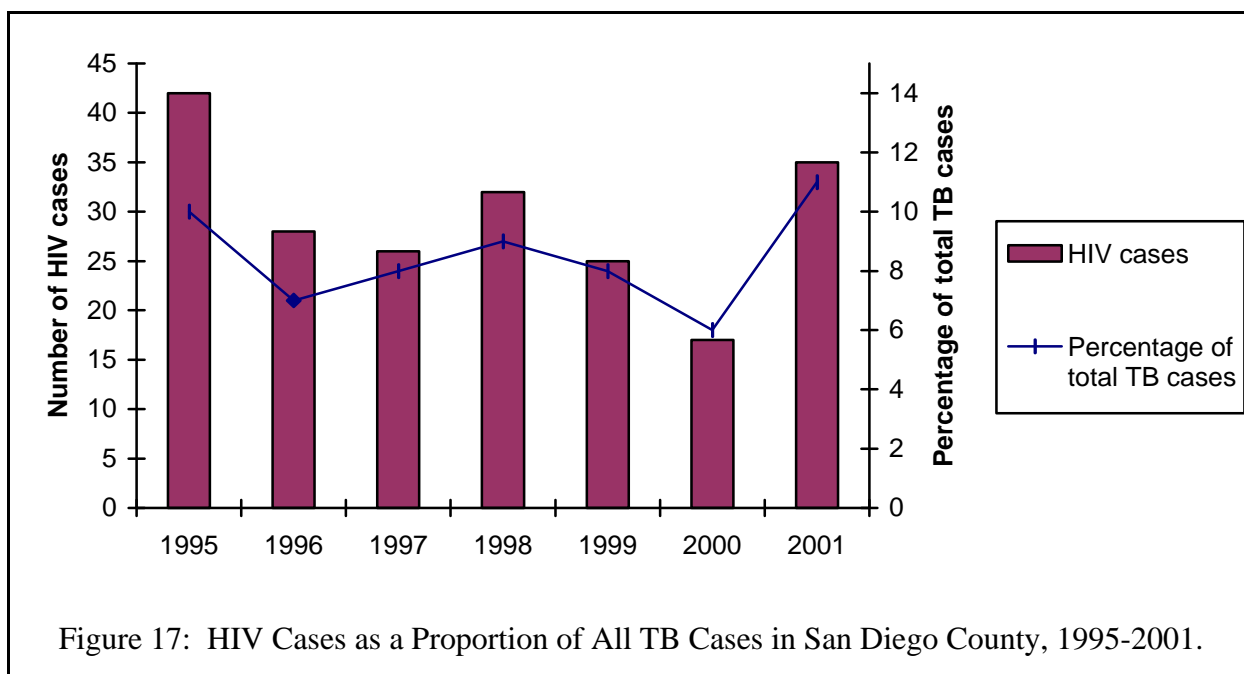


Figure 16: San Diego County TB Cases by Body Site of Disease, 2001

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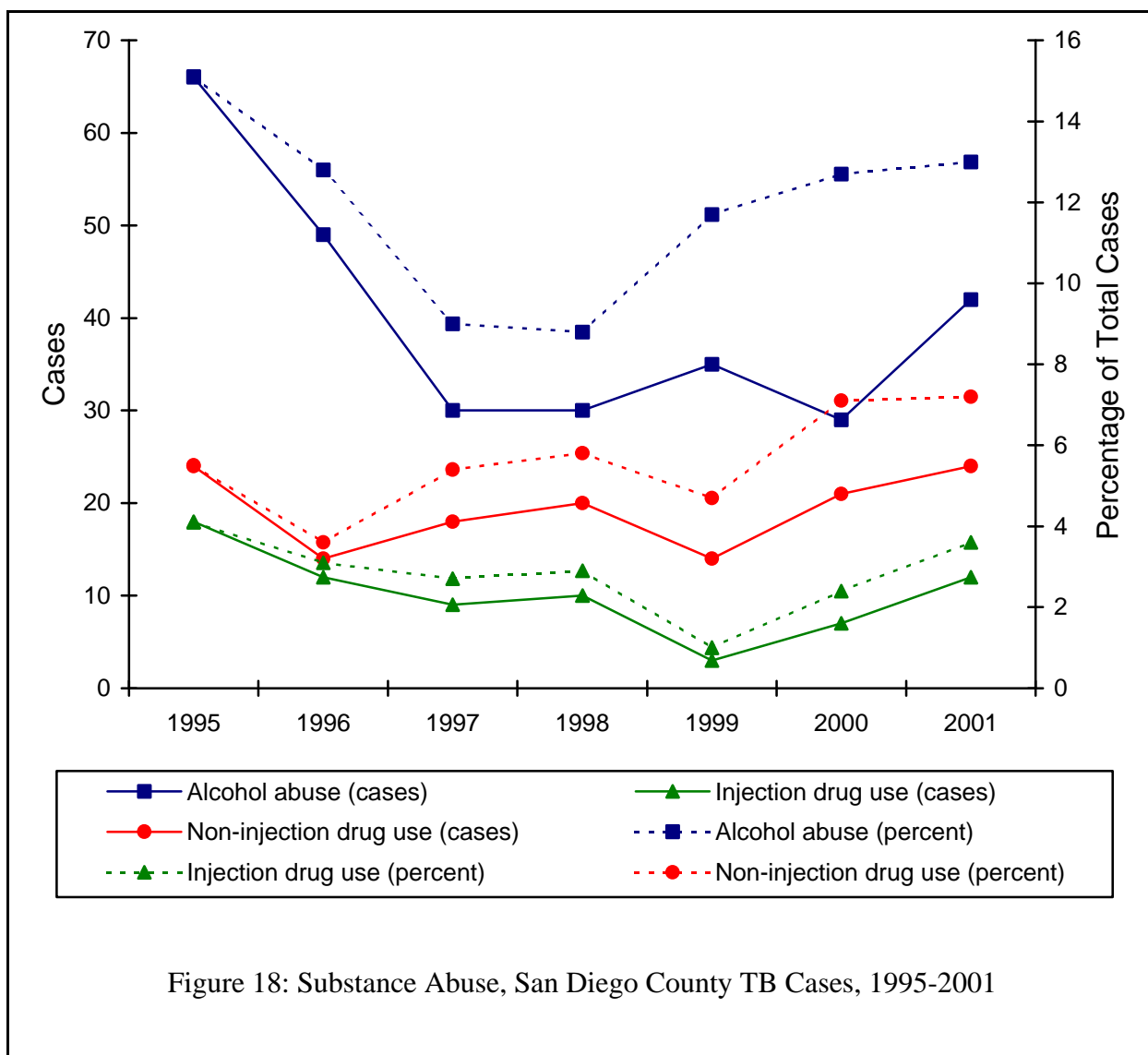
ease in 2001 (11%), a figure which has also shown little variation (9-11%) since 1995.

HIV Co-infection

Individuals co-infected with HIV are more susceptible to acquiring TB infection and progressing to active disease. While the lifetime risk for progression from infection to disease is under 10% for immunocompetent persons, the risk for progression in the HIV infected is approximately 8% per year. Active TB is more likely to disseminate to organs outside the lung in HIV patients and they are at increased risk for significant morbidity and mortality.

In 2001 in San Diego County, 35 patients with TB were co-infected with HIV, about 11% of total TB cases (Figure 17). Fifty-one percent (compared to 25% of non-HIV cases) of TB/HIV cases had disease at an extrapulmonary site with or without pulmonary TB (26% had extrapulmonary disease only). The estimated TB case rate for HIV infected persons was 277 per 100,000. This was greater than 20 times the overall case rate in San Diego County.

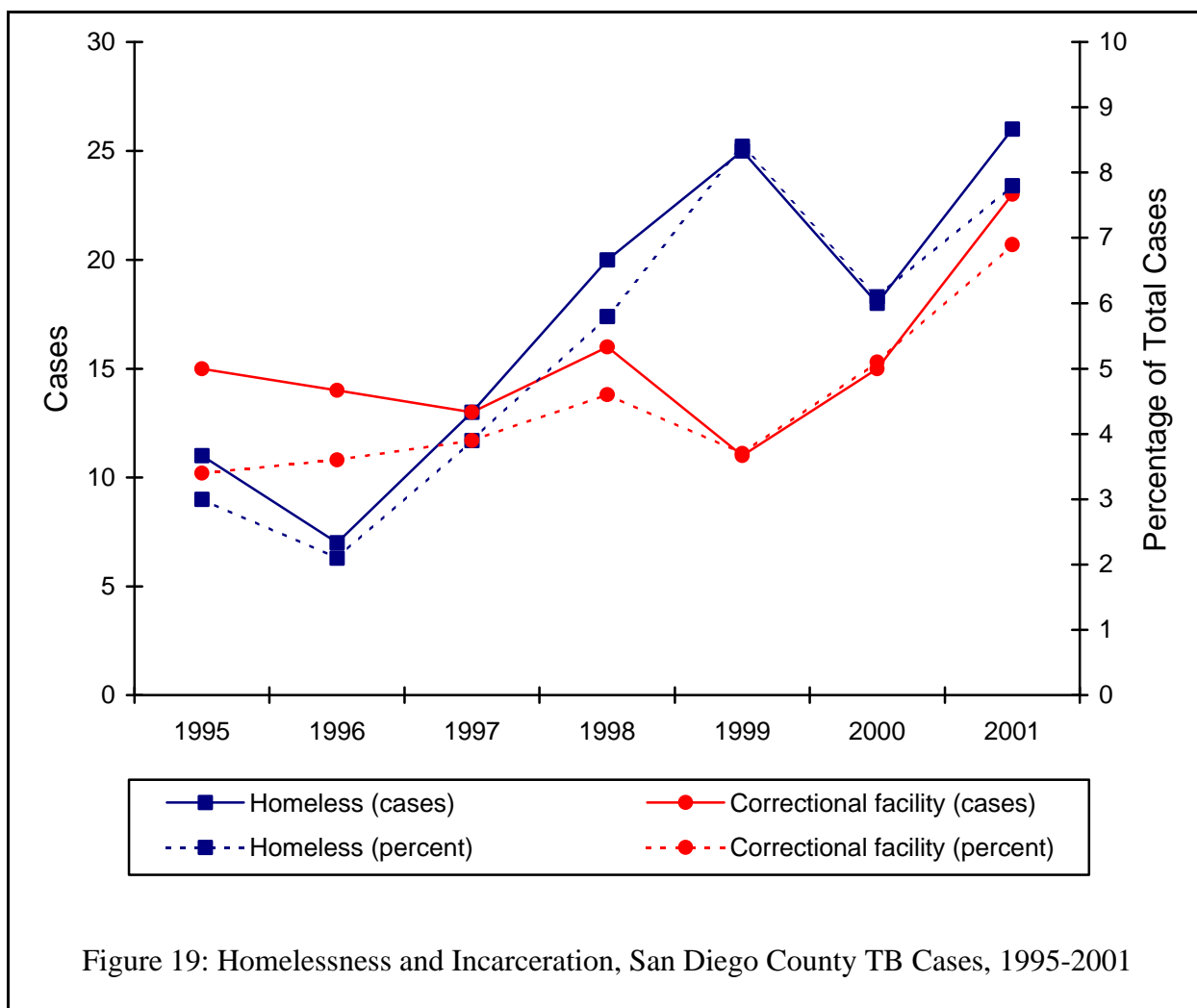
In 2001, most TB/HIV cases occurred in males (86%). Hispanics (65%) and Blacks (24%) and people in the 25 to 44 (57%) and 45 to 64 (34%) age groups comprised the majority of cases by race/ethnicity and age, respectively. From 2000 to 2001, the number of HIV infected cases increased from 17 to 35 (106%). There were 14 more HIV infected cases among Hispanics and 13 more HIV infected cases among persons born in Mexico, respectively, in 2001 compared with 2000.



Other High Risk Groups: Homelessness, Substance Abuse, Incarceration

A number of other conditions are associated with an increased risk for TB infection and disease. Among these are homelessness, substance abuse, and incarceration in jail or prison. Of 332 patients with TB in 2001, 26 (8%) were homeless, 42 (13%) abused alcohol, 12 (4%) injected drugs, 24 (7%) used non-injected drugs, and 23 (7%) were diagnosed while in a correctional facility (county jail: 5, state prison: 2, federal prison: 16). Figure 18 shows the absolute number of TB cases and the percentage of total TB cases noted to abuse alcohol, injection, and non-injection drugs for the years 1995-2001. Figure 19 shows the absolute number of TB cases and the percentage of TB cases that were homeless or diagnosed while in a correctional facility for the years 1995-2001. Eighty-one (25%) TB patients had at least one of these five risk factors for TB and 35 (11%) had multiple risk factors.

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Drug Resistant TB

TB may become resistant to medications if treatment is inadequate because of patient non-adherence or medical provider error. Resistant TB is more difficult to treat successfully, especially multi drug-resistant (MDR) TB, defined as TB which is resistant to both isoniazid (INH) and rifampin. MDR TB has a lower cure rate and a higher mortality rate.

In 2001, positive cultures for *M. tuberculosis* complex were obtained in 275 (83%) TB cases. The remaining 57 cases did not have cultures obtained or all cultures were negative. Of 275 culture proven TB cases, 45 (16%) were resistant to one drug, 4 (1%) were resistant to two or

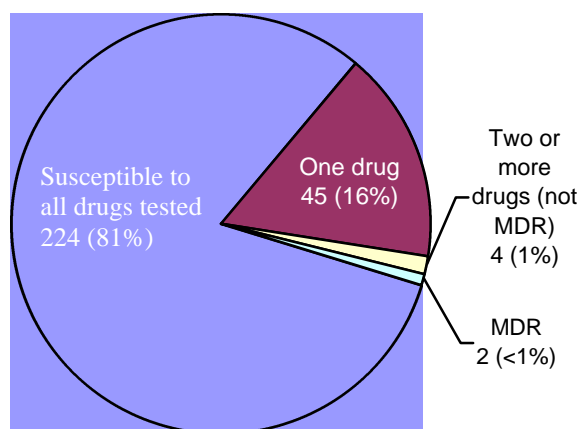


Figure 20: Drug Resistance
San Diego County TB Cases, 2001

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more drugs (not MDR) and 2 (< 1%) were MDR (Figure 20). Neither of the two patients with MDR TB and 1 (7%) of 14 patients with INH resistant TB, respectively, received TB treatment prior to their current episode (Table 3) indicating that they were originally infected with these resistant strains. One of two patients with MDR TB and 10 (71%) of 14 patients with INH resistant TB, respectively, were born outside of the US. Of the 35 MDR-TB cases in San Diego from 1993-2001, 30 (86%) were born outside the US. Twenty-three of 24 patients with pyrazinamide (PZA) resistant TB were infected with *Mycobacterium bovis* (described in subsequent section).

In terms of individual medications, 14 (5%) cases were resistant to INH (10 resistant INH alone, 2 resistant to INH and streptomycin, 1 resistant to INH and ethambutol, 1 resistant to INH and PZA), 24 (9%) were resistant to PZA, 0 were resistant to rifampin alone, and 2 (< 1%) were resistant to INH and rifampin (MDR) (Figure 21). The 2001 INH resistance rate of 5% is

| | INH resistant (excluding MDR) | | INH and rifampin resistant (MDR) | | Pyrazinamide resistant | |
|-------------------------|----------------------------------|-----------------------|-------------------------------------|-----------------------|------------------------|-----------------------|
| | No prior treatment | Prior TB treatment | No prior treatment | Prior TB treatment | No prior treatment | Prior TB treatment |
| Race | | | | | | |
| White | 2 | 0 | 0 | 0 | 0 | 0 |
| Black | 1 | 0 | 0 | 0 | 0 | 0 |
| Asian | 4 | 0 | 1 | 0 | 1 | 0 |
| Hispanic | 6 | 1 | 1 | 0 | 22 | 1 |
| Other | 0 | 0 | 0 | 0 | 0 | 0 |
| Country of birth | | | | | | |
| US | 4 | 0 | 1 | 0 | 5 | 1 |
| Mexico | 5 | 1 | 0 | 0 | 17 | 0 |
| Philippines | 2 | 0 | 0 | 0 | 1 | 0 |
| Other Asian countries | 2 | 0 | 1 | 0 | 0 | 0 |
| Africa | 0 | 0 | 0 | 0 | 0 | 0 |
| Other countries | 0 | 0 | 0 | 0 | 0 | 0 |
| Age groups | | | | | | |
| 0-4 | 0 | 0 | 0 | 0 | 3 | 0 |
| 5-14 | 0 | 0 | 0 | 0 | 2 | 0 |
| 15-24 | 1 | 0 | 1 | 0 | 5 | 0 |
| 25-44 | 8 | 0 | 0 | 0 | 9 | 0 |
| 45-64 | 2 | 1 | 1 | 0 | 2 | 0 |
| 65+ | 2 | 0 | 0 | 0 | 2 | 0 |

**Table 3: Drug Resistance - Race, Country of Birth, and Age
San Diego County TB Cases, 2001**

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about one half what it had been during the preceding 8 years (usually 10-12%). Because INH resistance exceeds the recommended threshold of 4%, all TB suspects and cases in San Diego County should be started on four drug chemotherapy (usually INH, rifampin, ethambutol, and PZA) while susceptibility results are pending.

In 2001, INH resistance varied by age group (Table 3). There were no INH-resistant TB cases in patients under 15 years of age. Ninety-three percent of INH-resistant cases occurred in individuals over 25 years of age. Ten of 14 (71%) TB cases with INH resistance were born outside of the US (6 Mexico, 2 Philippines, 2 other Asian countries) and 18 of 24 (75%) TB cases with PZA resistance were foreign-born (17 Mexico, 1 Philippines).

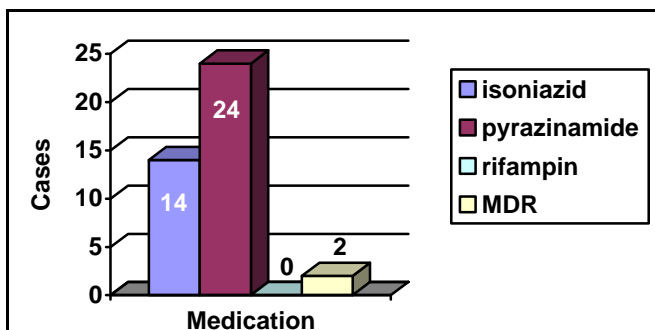


Figure 21: Resistance to Individual Medications in San Diego County TB Cases, 2001

Disease Due to *Mycobacterium bovis*

Disease due to *Mycobacterium bovis*, also known as bovine tuberculosis, is usually contracted through the consumption of unpasteurized dairy products. Person-to-person transmission via inhalation of aerosolized organisms (the method through which *M. tuberculosis* is spread - see "Evaluation of Close Contacts to TB Cases") is also believed to occur.

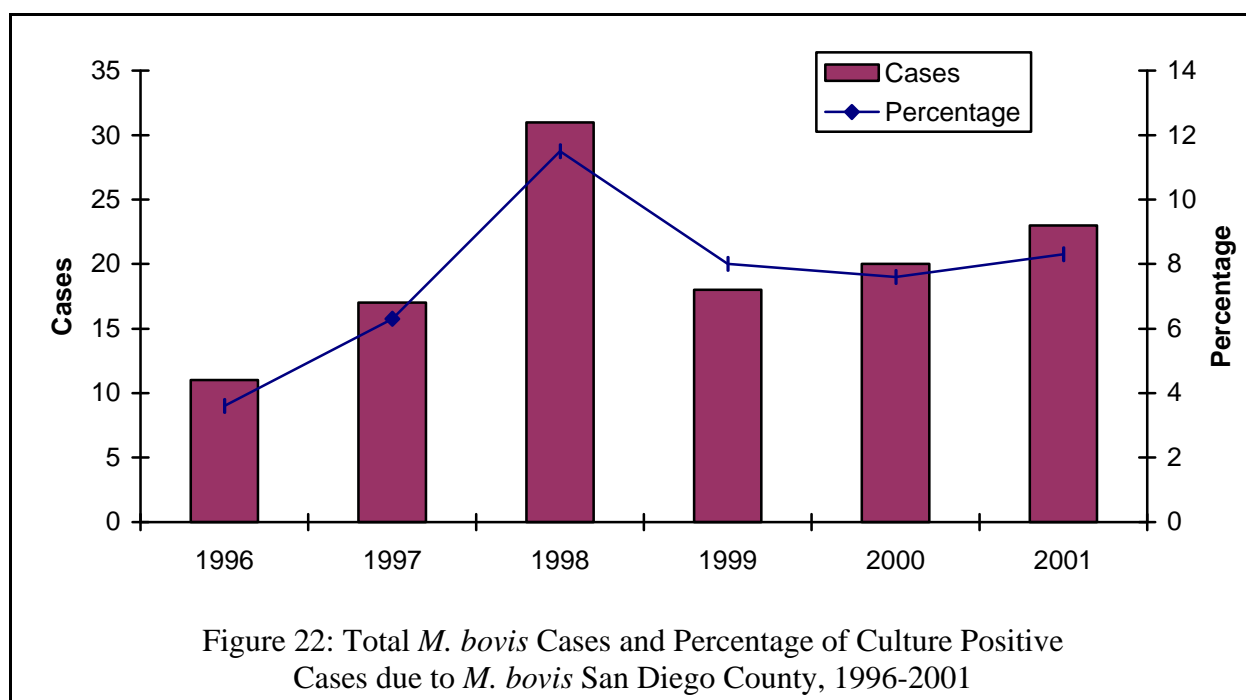


Figure 22: Total *M. bovis* Cases and Percentage of Culture Positive Cases due to *M. bovis* San Diego County, 1996-2001

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In 2001, 23 cases of *M. bovis* disease were reported in San Diego County (Figure 22). Since 1993, there have been 150 reported cases in the county. In 2001, all *M. bovis* cases occurred in Hispanics either born in Mexico (74%) or the US (26%) (Figure 23). Six patients (26%) with *M. bovis* disease were HIV-infected. Nine (39%) had disease at an extrapulmonary site. Extrapulmonary disease was seen more often in children (80%) than adults (18%) (Figure 24).

M. bovis is uniformly resistant to PZA and accounted for 96% of PZA-resistant cases in 2001. Since 1993, about 5% of *M. bovis* isolates have been resistant to INH. In 2001, 1 (4%) *M. bovis* case was INH resistant.

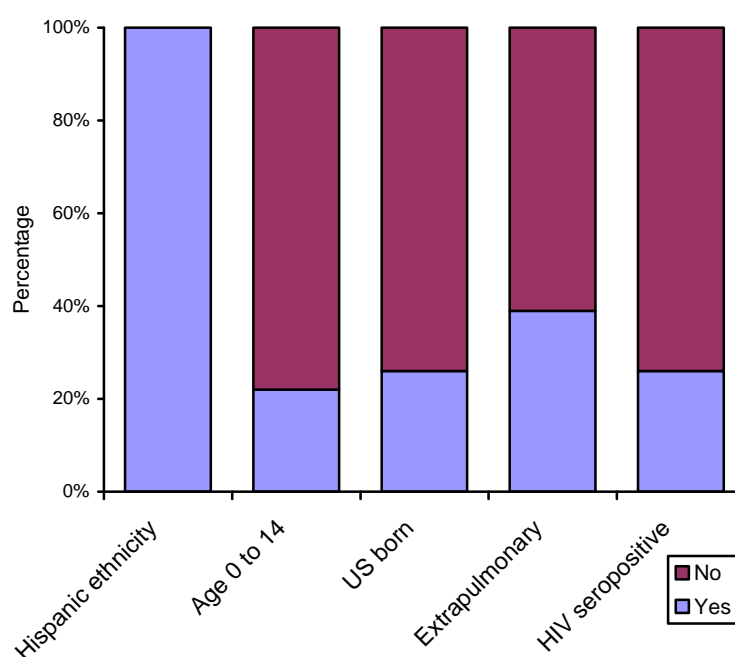


Figure 23: Characteristics of *M. bovis* Cases
San Diego County, 2001 (n=23)

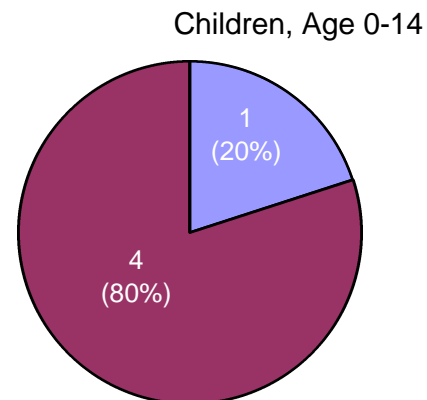
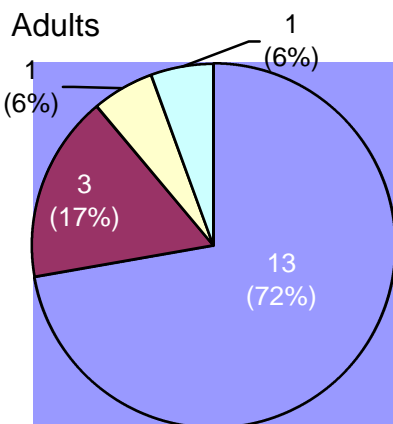


Figure 24: Major Body Site of Disease for Adults and Children
with *M. bovis* in San Diego County (2001)

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| | 1996 | 1997 | 1998 | 1999 | 2000 | Total |
|---|------------|------------|------------|------------|------------|------------|
| Started Treatment* | 367 | 311 | 334 | 292† | 290† | 1594 |
| Completed (<= 12 mos.) | 256 | 225 | 250 | 233 | 204 | 1168 |
| Completed (>12 mos.) | 60 | 43 | 36 | 27 | 11 | 177 |
| Still on Treatment | 0 | 0 | 0 | 2 | 22 | 24 |
| Moved | 22 | 19 | 17 | 10 | 15 | 83 |
| Died | 24 | 21 | 22 | 15 | 25 | 107 |
| Lost | 2 | 0 | 2 | 2 | 10 | 16 |
| Refused | 0 | 0 | 0 | 0 | 0 | 0 |
| Other | 3 | 3 | 7 | 3 | 3 | 19 |
| Percent Completion | 85% | 87% | 86% | 90% | 80% | 85% |
| Percent Completion (Excluding Died and Moved) | 98% | 99% | 97% | 98% | 94% | 97% |
| Percent Completion within 12 Months | 70% | 72% | 75% | 80% | 76% | 73% |
| Percent Completion within 12 Months (Excluding Died and Moved) | 80% | 83% | 85% | 88% | 89% | 84% |

* Excludes patients who died prior to the start of treatment.

† Completion rates exclude patients still on treatment.

Table 4: Treatment Outcomes for San Diego County TB Cases, 1996-2000

Treatment Outcomes (1996-2000‡ Cohorts)

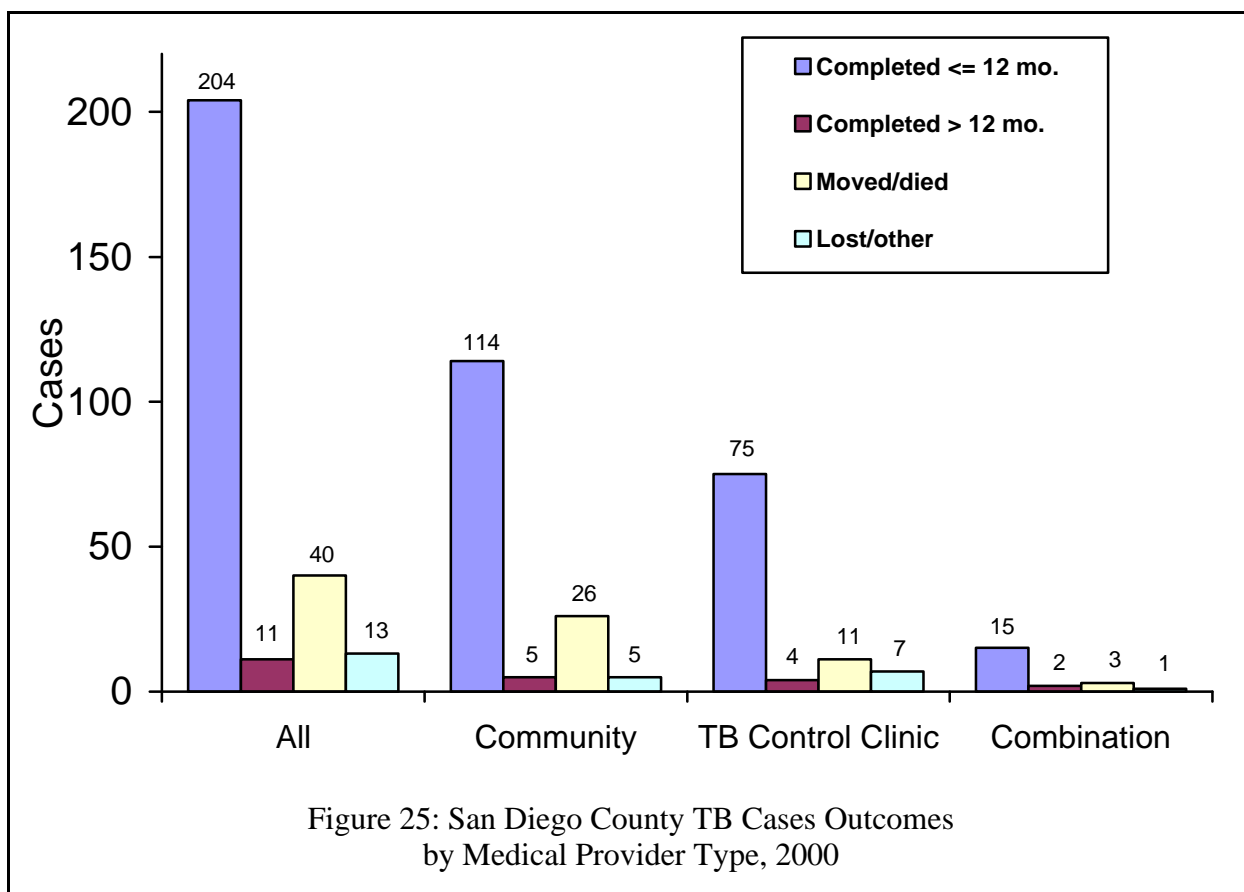
From 1996 through 2000, 1,594 patients with TB were started on treatment in San Diego County. Overall 85 percent of these patients completed treatment (Table 4) with 73 percent completing within 12 months. When patients who died or moved were excluded, the overall and 12 month completion rates were 97 and 84 percent, respectively.

Treatment Outcomes for 2000 Cohort: Medical Provider Type

In San Diego County, most TB patients are treated, at least in part, by community providers. The TB Control Program provides case management and other assistance for all TB cases, regardless of medical provider type. For the 2000 cohort, 150 (56%) patients received treatment solely from community providers, 97 (36%) patients were treated at the TB Control Clinic, and 21 (8%) received treatment from a combination of both (Figure 25). Including patients who died or moved, treatment outcomes were the same for patients treated at the TB Control Clinic (81% completion) compared with those treated by community providers (79% completion).

‡ Much of the outcome data for the 2001 cohort is not yet available as many patients remain on treatment.

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When patients who moved or died were excluded, the completion rates were also similar: 92 and 96 percent for TB Control Clinic and community providers, respectively. Of those completing therapy, 95% of cases treated at TB Control Clinic and 96% of cases treated by community providers finished within 12 months.

Use of Directly Observed Therapy in 2000 TB Cases

To treat active tuberculosis, multiple medications must be given for at least six months. If therapy is interrupted or taken inappropriately, drug resistance may develop. In order to overcome the problem of patient non-adherence to treatment, many health departments offer directly observed therapy (DOT). DOT entails the administration of medication under the direct observation of a nurse or outreach worker. Use of DOT has been demonstrated to increase TB cure rates and decrease acquired and primary drug resistance.

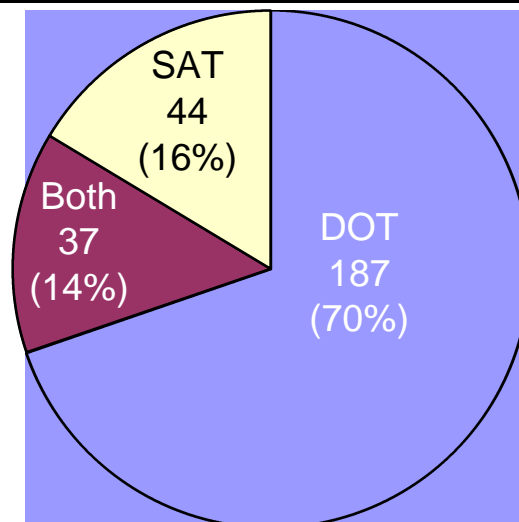


Figure 26: Use of DOT
San Diego County TB Cases, 2000

DOT is the best means of ensuring treatment for most patients and is used as an adjunct to other types of supportive care. Priority for DOT assistance is given to patients with drug resistance, suspected or documented non-adherence to treatment, unstable housing, ongoing substance abuse, severe immunosuppressive diseases or conditions, patients taking multiple medications for other conditions, and children.

In 2000, final information on the method of treatment, DOT versus self administered (SAT), was available for 265 of 290 TB cases started on therapy. Approximately 84% of these patients received some or all of their treatment as DOT (Figure 26).

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| | |
|--|-----|
| Infectious pulmonary cases for investigation | 131 |
| Number of contacts identified | 918 |
| Number of contacts evaluated for infection and disease | 796 |
| Number of contacts with TB disease | 10 |
| Number of contacts with latent TB infection | 310 |
| Number of contacts who started LTBI treatment | 221 |
| Number of contacts who completed LTBI treatment | 137 |
| Average number of contacts per case | 7.0 |
| Disease rate for contacts | 1% |
| Latent infection rate for contacts | 39% |
| Treatment start rate for contacts | 71% |
| Treatment completion rate for contacts | 62% |

**Table 5: Contact Investigation of Infectious Pulmonary TB Cases
San Diego County, 2000**

Evaluation of Close Contacts to Infectious Pulmonary TB Cases (2000 Cohort)

TB is transmitted via infectious airborne particles produced by patients with pulmonary (lung) TB. Likelihood of transmission depends on six factors: 1) infectiousness of the TB case; 2) proximity of contact to the TB case; 3) duration of contact to the TB case; 4) host susceptibility; 5) the environment in which contact occurs (i.e. the risk increases with poor ventilation); and 6) virulence of the TB strain. When deciding whether an individual who has been in contact with a TB patient needs evaluation for TB infection, all of these factors are considered. Priority for contact investigation is given to highly infectious cases (e.g. pulmonary disease: AFB smear positive and/or cavitary disease and/or extensive infiltrates), highly susceptible contacts (e.g. children and immunosuppressed contacts), and contacts with prolonged, close exposure to the source case (e.g. household members).

In 2000, San Diego County TB Control identified 918 close contacts of infectious pulmonary TB cases (results of contact investigation are shown in Table 5). Seven hundred ninety-six (87%) of these received an evaluation for TB infection by San Diego TB Control or by a community provider. Of contacts evaluated, 310 (39%) were found to have latent TB infection and 10 (1%) were found to have active TB disease. Two hundred twenty-one patients (71%) with latent TB infection started treatment. Of these, 137 (62%) completed treatment for latent TB infection.

Treatment of Latent TB Infection (2000 Cohorts)

The majority of patients who are infected with TB do not become ill with disease immediately after infection. Most individuals achieve a state of equilibrium in which TB organisms remain alive within their body, but do not multiply and cause disease. This state is known as latent infection. Persons with latent infection remain at risk for the development of disease, known as reactivation, for the rest of their lives. The overall lifetime risk for progression from latent infection to active disease is approximately 10%. About half of this risk occurs within the first two years after infection. The risk for progression to active disease is much higher for immunosuppressed persons. For example, AIDS patients who are infected with TB have an estimated risk of developing active TB of 8% per year.

The risk of progression to active disease can be greatly reduced by providing treatment for latent infection. Latent TB is usually treated with a single medication (isoniazid) for nine months, but other regimens are used, such as rifampin and pyrazinamide for two months. Guidelines for treatment of latent TB infection can be obtained from San Diego County TB Control, the Centers for Disease Control and Prevention (CDC), or the American Thoracic Society.

Completion rates for treatment of latent TB infection for San Diego County TB Control Clinics and programs funded by San Diego TB Control through its cooperative agreement with the CDC's Division of Tuberculosis Elimination are shown in Table 6. In 2000, 1,464 patients were started on treatment in San Diego County TB Control clinics. Of these, 1,003 (69%) completed 6-9 months of therapy.

One latent TB infection treatment program involves a partnership with local community health centers (CHCs). There are a large number of high-risk, uninsured persons within the county, for whom provision of preventive services is especially problematic. CHCs are frequently the "medical homes" for these populations because of their neighborhood locations, sliding fees, and attention to linguistic and cultural sensitivity. Since several CHCs expressed interest in improving access to TB services for these groups, contracts were signed with five CHCs in 1998. Under these contracts, the CHCs received funds for each person who started latent TB infection treatment if they were uninsured and fit a high-risk category. For the year 2000 (the most recent year for which complete data are available), 228 patients were enrolled. Of 225 patients (excludes 3 who moved out of county), 175 (78%) completed latent TB infection treatment, 35 (15%) were lost to follow-up, and 15 (7%) stopped therapy. To increase enrollment in 2001, new contracts were awarded to 15 CHCs. This resulted in a greater than threefold increase in patients enrolled (708 patients for year 2001). Outcome information is not yet available due the length of time needed to complete treatment with isoniazid (goal is 9 months duration).

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| | TB Control Clinics | Community Health Center Program | School Entry Screening Program | Total |
|---------------------------------------|--------------------|---------------------------------|--------------------------------|------------|
| Patients started on treatment* | 1464 | 225 | 16 | 1705 |
| Completed | 1003 | 175 | 12 | 1190 |
| Lost | 55 | 35 | 0 | 90 |
| Stopped by patient | 143 | 10 | 4 | 157 |
| Stopped by physician: side effects | 7 | 4 | 0 | 11 |
| Stopped by physician: no side effects | 20 | 1 | 0 | 21 |
| Patient became pregnant | 4 | 0 | 0 | 4 |
| Completion rate | 69% | 78% | 75% | 70% |

* excludes patients still on therapy and those who moved

**Table 6: Completion of Treatment for Latent Infection
San Diego County TB Control, 2000**

A second program works with local middle and high school districts to improve access to latent TB screening, education, and treatment for predominantly Hispanic and Asian students who are recent immigrants to the United States. For the school year 2000-2001, 484 students were enrolled in this program. Of 280 students who underwent skin testing, 69 (25%) tested positive. Completion outcomes were available for only 16 students and 12 completed a course of medication. For the 2001-2002 school year, five new schools were added to the program and data collection procedures improved. Five hundred seventy-four students have been enrolled and skin tested so far in the current school year.

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